

Name:	School:	Target Grade:
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**HEADSTART QUIZ TO
SECONDARY 4 E MATH****READ THESE INSTRUCTIONS FIRST****INSTRUCTIONS TO CANDIDATES**

1. This is a 30 marks quiz.
2. There's only 5 chapters left in Sec 4 for E Math. Many of them are easy.
3. Priority is to get your Sec 3 Algebra, Trigonometry & Circles Strong because that will take up half of the entire syllabus.

Word of Encouragement:

No matter your Sec 3 grades, let Secondary 4 be a fresh new chapter!

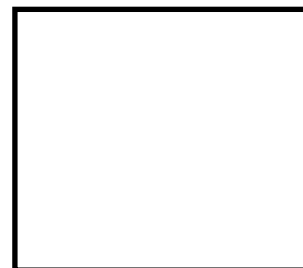
This is your O Level Year.

We want to see you get a Distinction for Math.

You've got this—believe in yourself!

I believe in you.

Team Paradigm

**PARADIGM**

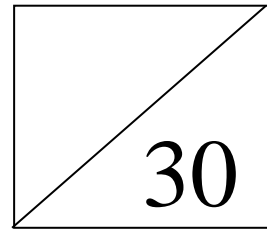
[Turn Over]

Name: _____

Class: _____

Date: _____

Secondary 4E Mathematics
HEADSTART



1 Given that $(x + y)^2 = 3$ and $6xy = 14$,

(a) find an expression for $x^2 + y^2$.

[1]

(b) Hence or otherwise, find the value of $(3x + 2y)^2 + 5y^2$.

[2]

2 (a) Solve $5 + \frac{5x-2}{6} = x$.

[1]

(b) Simplify $\frac{9a^2+b^2}{9a^2-b^2} - \frac{3a-b}{3a+b}$.

[2]

3 Given that $a = c + \sqrt{\frac{2(b^2+1)}{a}}$, express b in terms of a and c. [2]

4 An empty pool has a capacity of 20 000 litres.

Hose A can fill the pool at a rate of x litres per minute.

Hose B can fill the pool at a rate of $(x - 8)$ litres per minute.

(a) Write down an expression, in terms of x , for the number of minutes it would take to fill the pool using hose A. [1]

(b) Write down an expression, in terms of x , for the number of minutes it would take to fill the pool using hose B. [1]

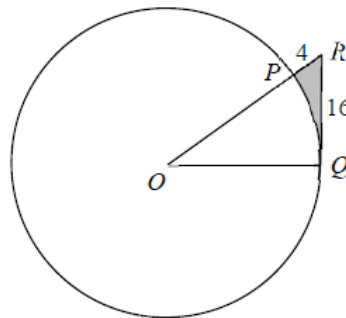
(c) It takes 2 hours longer to fill the pool using hose B than it does using hose A. Write down an equation to represent this information and show that it reduces to $3x^2 - 24x - 4000 = 0$. [2]

(d) Solve the equation $3x^2 - 24x - 4000 = 0$, giving your solutions correct to two decimal places. [1]

(e) Calculate how long it would take to fill the empty pool using hose A and hose B together. Give your answer in hours and minutes, correct to the nearest minute.[1]

5 Simplify $\left(\frac{8p^6}{27m^3}\right)^{-\frac{1}{3}}$, leaving your answer in positive index form. [2]

6 P and Q are points on a circle, centre O . RQ is a tangent to the circle at Q .
 $PR = 4$ cm and $RQ = 16$ cm.



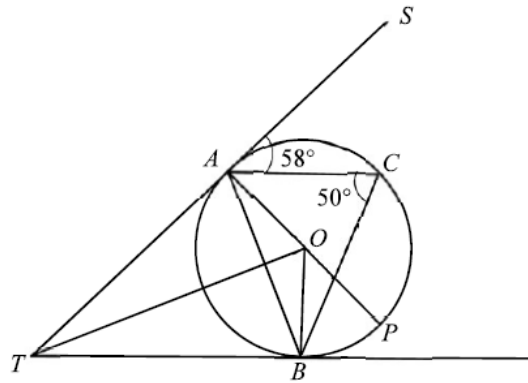
(a) Show that the radius of the circle is 30 cm. [1]

(b) Find the angle ROQ in radians. [1]

(c) Find the perimeter of the shaded region. [1]

(d) Calculate the area of the shaded region. [1]

- 7 In the diagram, O is the centre of the circle. SAT and BT are tangents to the circle. AP is the diameter. $\angle SAC = 58^\circ$ and $\angle ACB = 50^\circ$.



(a) Show that triangle AOT is congruent to triangle BOT . [1]

(b) Find

(i) $\angle CAO$, [1]

(ii) $\angle AOB$, [1]

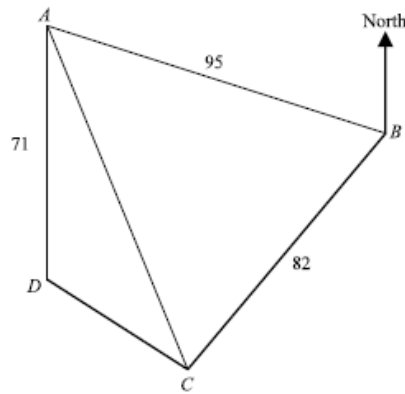
(iii) $\angle ATB$, [1]

(iv) $\angle OBC$, [1]

Show your working and give reasons

(c) A point D is such that $ACBD$ is quadrilateral where $\angle ADB = 130^\circ$. Determine whether D lies on the circumference of the circle. [1]

- 8 Quadrilateral $ABCD$ is a field on horizontal ground.
 A is 95 m from B on a bearing of 280° .
 B is 82 m from C on a bearing of 025° .
 D is due south and 71 m from A .



Calculate

- (a) area of triangle ABC , [1]

- (b) AC , [1]

A vertical tower of 67 m stand at D . A man walked along AC .
 He stopped at E to take a picture of the tower where the angle of elevation of the top of the tower was the greatest.

- (c) Calculate the angle of elevation of the top of the tower at E . [2]